Westinghouse Electric Corporation
Low Voltage Breaker Division
Beaver, Pennsylvania 15009

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New Information
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Type GFM Ground Fault Protection Devices

Description

Westinghouse Type GFM devices are Class 1 Ground Fault Sensing and Relaying devices designed to comply with the requirements outlined in Underwriters' Laboratories, Inc. Standards for Safety entitled: Ground Fault Sensing and Relaying Equipment, UL 1053.

Type GFM devices, when properly installed on a grounded electrical distribution system, will sense phase to ground fault currents and cause a disconnect to open and clear the fault instantaneously at predetermined current values. These devices have a maximum voltage rating of 600V, 50/60 Hertz and may be applied in accordance with Article 230-95 of the National Electrical Code.

Type GFM Ground Fault Protective Devices are self-contained combination sensing and relaying devices designed primarily for application on motor circuits and fixed loads where low level Ground Fault Equipment Protection is required.

GFM devices are available in two basic types with each type having two physical sizes as indicated in Table No. 1.

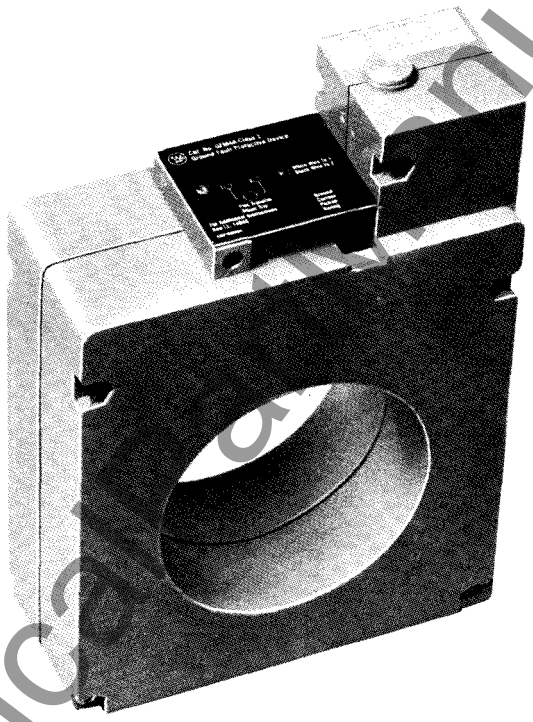
The two basic types differ in the type of output circuit provided. The first type, designated either GFM2 or GFM4, employs an internal relay having S.P.D.T. contacts that will operate a remote shunt trip device where control power is available.

The second type, designated either GFM2A or GFM4A, is completely solid state with an output SCR circuit designed to operate a remote, low-energy, flux transfer shunt trip mounted in a molded case breaker. No supplementary control power for the shunt trip is required.

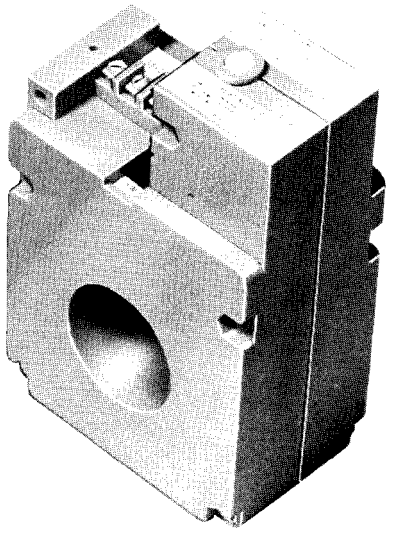
Application

Type GFM devices may be installed in Zero Sequence or Ground Return Sensing methods as indicated generally in Figure 1 and 2. Proper Ground Fault Protection schemes are dependent upon proper system installation and grounding methods.

A typical Motor Protection Application is shown in Fig. 3.



Type GFM-4A



Type GFM-2

Table 1: GFM Sensing and Relaying Device Type Tabulation

Catalog Number	Output Type	Approx. Window Opening in Inches	Basic Ampere Rating (Plug-Omitted)	For Use with Type Shunt Trip	Operation Time @ 10 x Ampere Rating
GFM2	Relay	1.953	5	Standard	0.03 Sec.
GFM2A	SCR	1.953	5	Flux① Transfer	0.03 Sec.
GFM4	Relay	3.953	5	Standard	0.03 Sec.
GFM4A	SCR	3.953	5	Flux① Transfer	0.03 Sec.

Size Selection

The proper size selection is a function of the conductor size of the equipment being protected. Types GFM2/GFM2A have approximately a two-inch window opening. Types GFM4/GFM4A have approximately a four-inch window opening.

① Refer to Technical Data 29-721 for available styles.

Rating Selection

The basic Ground Fault Current Pickup rating of either type GFM device is 5 amperes, i.e., each unit when properly installed will initiate a trip signal to a remote shunt trip with the presence of a 5 ampere Ground Fault Current within established tolerance limits. Separate optional rating plugs (Technical Data 29-721) are available to alter the pickup rating to a maximum of 100 amps.

Electrical Data

Protected Primary Circuit:
Maximum Voltage Rating -600 Volts-50/60 Hz
Maximum Ground Fault Current -100,000 Amps for 0.1 Sec.
Sensor Thermal Rating① -300 Amps

Contact Rating: Refer to Table No. 2.

Tolerance: Current Pick-up ± 10%.
Time ± 20%.

Ambient Temperature Range: 0-40°C.

Dielectric: Wiring Terminals shorted to Ground 1500V., RMS.

① Thermal Rating is the maximum continuous Ground Fault Current that can exist through the primary of the current sensor without overheating the sensor.

Output Circuitry

Contact ratings for Type GFM2 and GFM4 are shown in Table No. 2. Types GFM2A and GFM4A are intended to be used only with special remote flux transfer shunt trips.

Table 2: Contact Rating for GFM2 or GFM4 Devices

Control Voltage	Freq. (Hz.)	Type Load	Ampere Rating @ 0.033 Sec.	0.25 Sec.	Continuous
28	dc	Resistive	10	10	10
36	dc	Resistive	4.5	4.5	4.5
48	dc	Resistive	3.0	3.0	3.0
60	dc	Resistive	2.0	2.0	2.0
125	dc	Resistive	1.0	1.0	0.5
120	50/60	80% P.F.	40	40	10
240	50/60	80% P.F.	22	22	10

Control Power

Internal control power is not required to operate Type GFM Ground Fault Protective devices. All internal control power required is derived from the Ground Fault current through the internal current sensor.

External control power is required to operate the remote shunt trips used in conjunction with Type GFM2 and GFM4 devices.

External control power is not required with Type GFM2A and GFM4A devices to operate the remote, low-energy, flux transfer shunt trips used in Molded Case breakers.

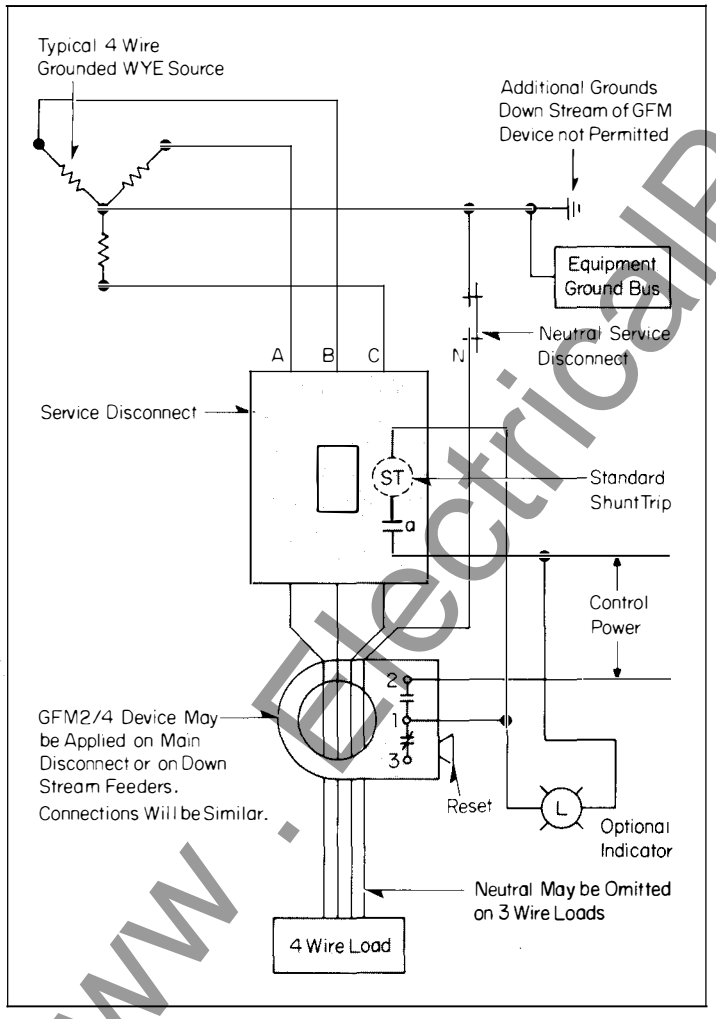


Fig. 1 Typical Zero Sequence Application

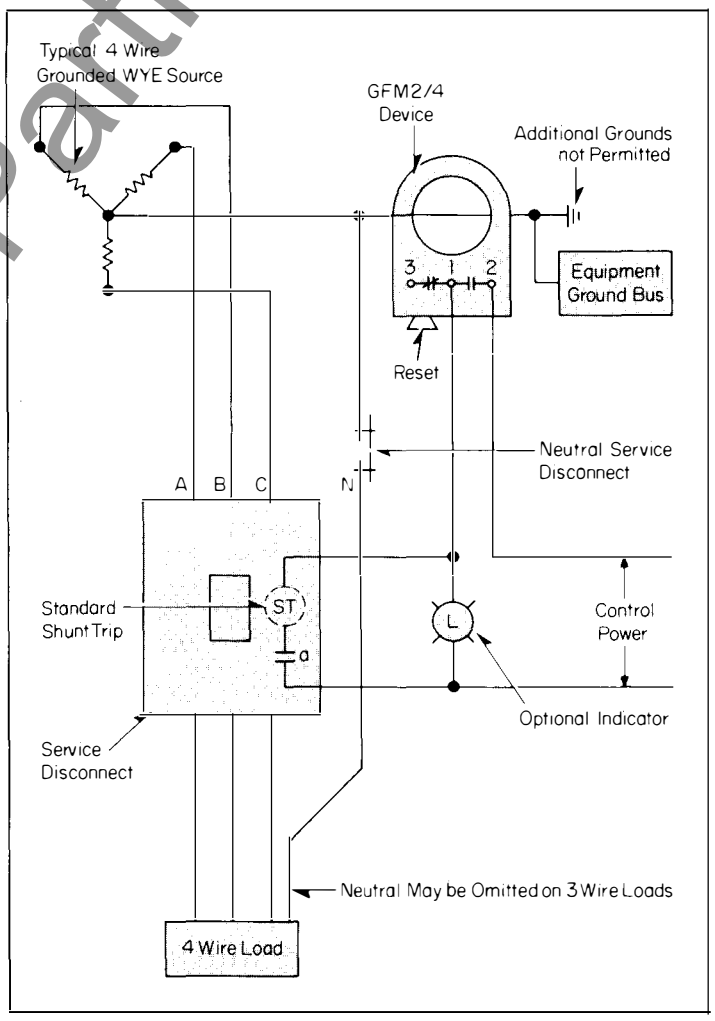


Fig. 2 Typical Source Ground Application

Trip Indication/Reset

A combination visual indicator and reset button is provided on the top of Type GFM-2 and GFM-4 devices to indicate the initiation of a tripping action to clear a Ground Fault. The operation of the internal relay will cause the white button to visibly raise.

To reset the device, the Indicator/Reset button must be depressed. Failure to reset the device will not allow the associated disconnect device to be reclosed.

No Indicator/Reset button is provided on Types GFM2A or GFM4A since an internal SCR – rather than a relay – is used in the output circuit. These devices reset automatically when the disconnect opens to clear the Ground Fault.

Time Current Curves

Time Current Curves are shown in Fig. 4. The operating time of the GFM (0.03 seconds) is established for a Ground Fault Current value equal to (10) times the rating of the installed rating plug. The operating time will be slightly longer for currents less than (10) times.

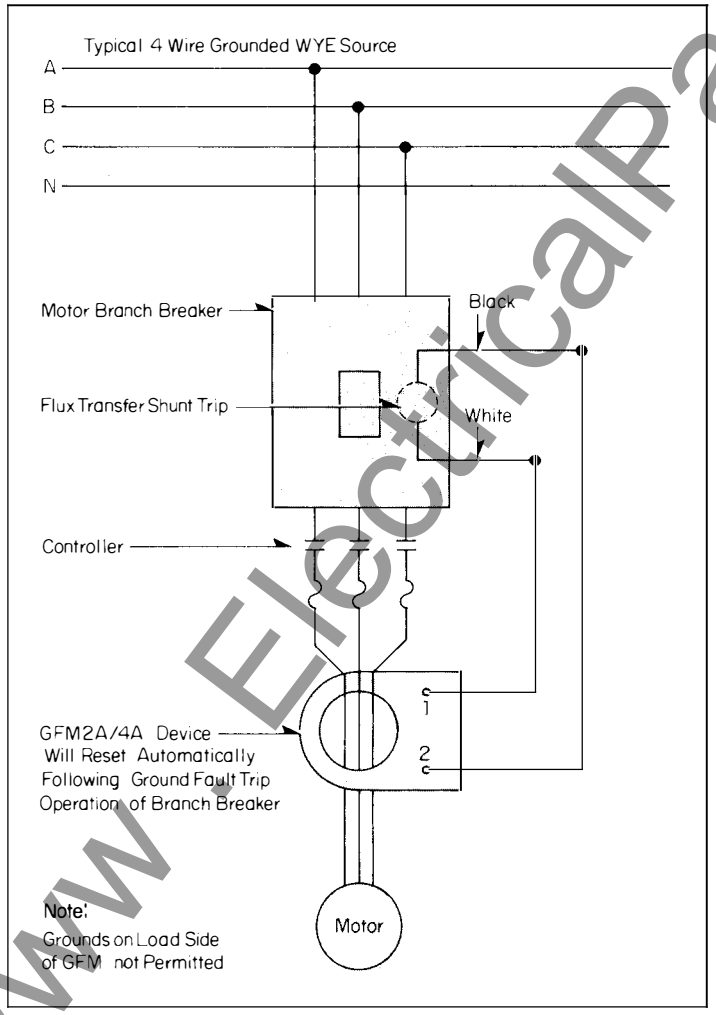


Fig. 3 Typical Motor Application Using Branch Breaker with Flux Transfer Shunt Trip and GFM-2A/GFM-4A

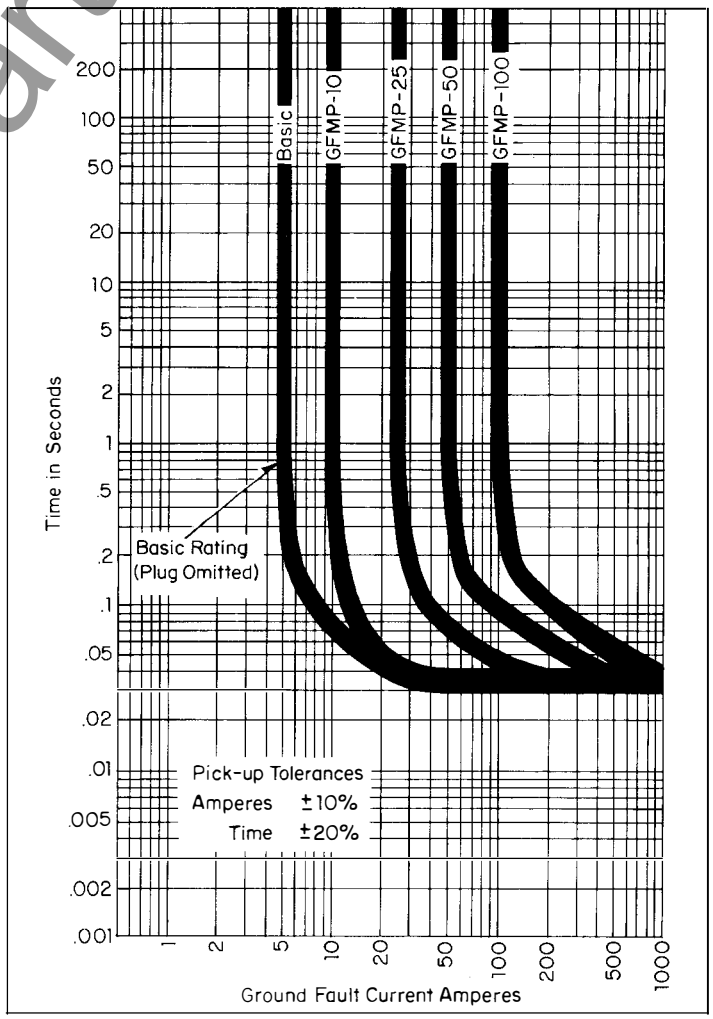


Fig. 4 Time-Current Curves

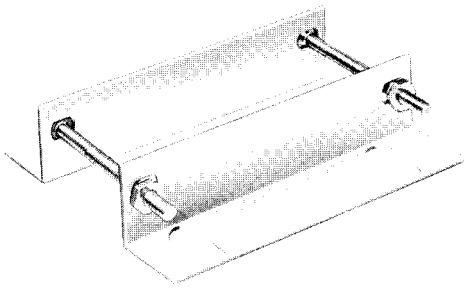
Installation

Mounting

Each Type GFM device contains a Ground Fault Sensor which is a special current transformer. These are insulated devices which can be mounted directly to enclosure surfaces. Four tubular rivets secure the sensor housing. These four (0.200 dia.) mounting holes can be used to mount the GFM device in either a vertical or horizontal mounting position.

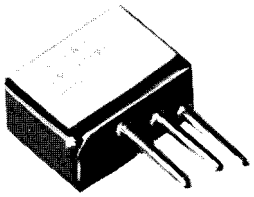
As an alternate, optional mounting brackets are available. These brackets may be mounted on either the bottom or side depending upon the installation requirements.

Regardless of the mounting method used, the top of the device with the visual indicator/reset button and nameplate instructions should be maintained in a visual position after installation. GFM devices should be installed so that all conductors passing through the conductor window are physically centered.

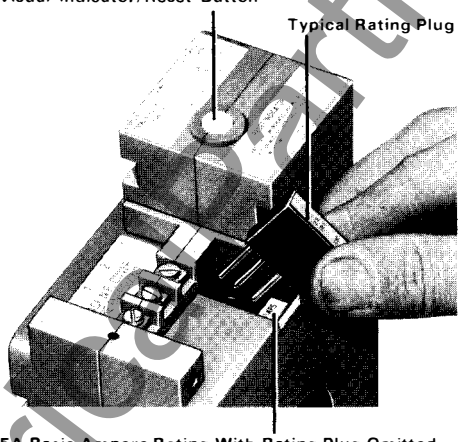


Optional Mounting Bracket

Rating Plug Installation



To install an optional rating plug to obtain other than the minimum 5 ampere rating, remove the terminal cover held in position by a single screw and retention groove. With the cover removed insert the rating plug in the position indicated. The rating plug is held captive in position with the addition of the terminal cover after the wiring is completed. With the terminal cover in position, the ampere rating of the rating plug remains visible.



Installation of GFM Rating Plug

Wiring

Wiring will vary depending upon the choice of GFM selected. Suggested schemes are given in Figures 1, 2 and 3. Supplementary instructions and details are shown on the terminal cover.

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